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character, but it is hardly satisfactory even when most distinctive, and is often obscure and hard to ascertain, and, in a consideration of the species of a relatively limited area, its use may well be avoided. In his treatment of the American species, Prantl's work is in some respects deficient, owing to the fact that his material of these plants was for the most part scanty. For example, his description of *O. crotalophoroides*, a species originally from South Carolina, was with two exceptions based on South American collections. Of *O. californicum* he saw only part of one collection, of *O. tenerum*, one specimen, and similarly of others from South America. The result has been that some of his descriptions are rather incomplete, but in view of his insufficient material it is to be wondered that he was able to define the species as accurately as he did, and it is a tribute to his ability that his conception of specific limits has, after study of ample material, been generally affirmed.

NEW YORK BOTANICAL GARDEN.

THE STORY OF THE MANGROVE

BY GEORGE V. NASH

Those who have been to the southern parts of our own state of Florida, or have visited the shores of tropical America, have perhaps noticed, fringing the shores in many places, a shrub or small tree, from the horizontal branches of which descend long gaunt roots, and bearing, usually in great profusion, long club-shaped pendulous bodies which sway and dangle in every breeze. But have you realized the vast importance of this plant and the tremendous work it is accomplishing, and have you really understood what those peculiar long bodies are and what an important part they play in the dispersal of this plant, and hence in the increase of tillable land in the tropics, for this unassuming plant is a great land builder — how I will attempt to show later.

To fully understand what the plant is doing, we must first understand the plant itself. A native of the lowlands of its home, where it is always warm, this plant seems to have no seasonal

activity, but to be always growing, so that flowers and fruit may be found upon it at almost any time. If you will examine the flowers you will find that they have four sepals and petals, and present an appearance not unlike many other flowers with which you are acquainted. But look further, and you will find hanging to the tree numbers of club-shaped bodies six to eight inches long, or even longer, in the manner shown in the fourth illustration of this article, where in the higher branches these may be



FIG. 1. Showing hypocotyls and mangroves in various stages of development.

clearly seen. It is these odd bodies which are peculiar to the mangrove, and which lend to it its great interest, but what are they? They are really young plants, for the seeds of the mangrove germinate while still in the ovary, the developing embryo finally bursting through the apex of the ovary and producing these long club-shaped bodies, known to botanists as hypocotyls. It is not the hypocotyl which is peculiar to the mangrove, for this is found in all young plants, but it is the great and unusual

development of this organ, while still attached to the tree, which is peculiar. At the small end of these peculiar bodies is the plumule, where are concealed the first leaves of the plant, while the other end of the hypocotyl is much enlarged.

Now what happens when the young plant has reached that stage in its development when it separates from the parent tree? The mangrove, as has been said, grows along the shore, and the pendant hypocotyl, when it breaks from the tree, falls, as would

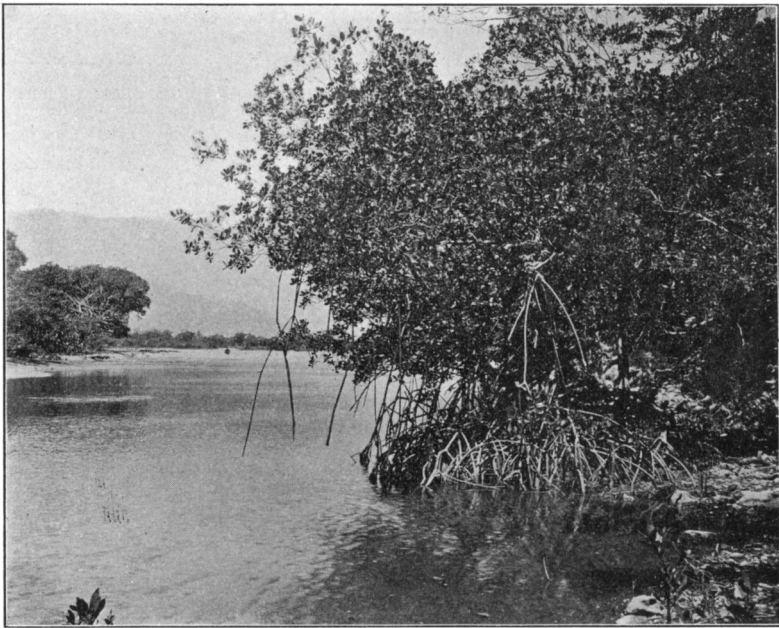


FIG. 2. A well-developed colony extending itself into the water.

a plummet, the big end down. If the water under the tree be shallow, and even eighteen inches would not thwart its object, these bodies penetrate the mud in an upright position and soon take root, sending forth their leaves and in a short time developing into vigorous plants. If, on the contrary, the water be too deep, they rise to the surface after their plunge and float about, for they are lighter than the water, at the capricious whim of tides and winds. In time some of them find a resting place on

a congenial shore, perhaps after tortuous and devious journeyings, and form the basis of a new colony. This is well shown in the first illustration, where a number of these plants may be seen in the hypocotyl stage. To the left is a young one firmly attached to the soil and beginning to grow, while in other parts of the picture will be found other plants in various stages of development. This colony increases until a condition represented in the second picture is reached. Here we see the network of roots,



FIG. 3. Interior of a mangrove swamp, showing interlacing roots.

to which reference will again be made, and also the long gaunt roots descending from the spreading branches. It is these descending roots which extend the zone of the mangrove further and further into the water. Imagine this process to have continued for a number of years, then let us enter one of these mangrove swamps, and we would see before us a vast tangle of arching and interlacing roots, as represented in the third illustration, the surface of this entangled mass being two to three or

four feet above the slimy ooze below. And what purpose does this vast sieve-like mass effect? As the tide rushes in it bears with it masses of decaying vegetable matter and detritus of various kinds, which, when the tide runs out, is in large part left behind. These, added to the decaying leaves which are constantly dropping from the trees above, at length build up a slimy bottom, which, eventually rising above the water, in time becomes solid ground and fit for agricultural purposes. The continuation of

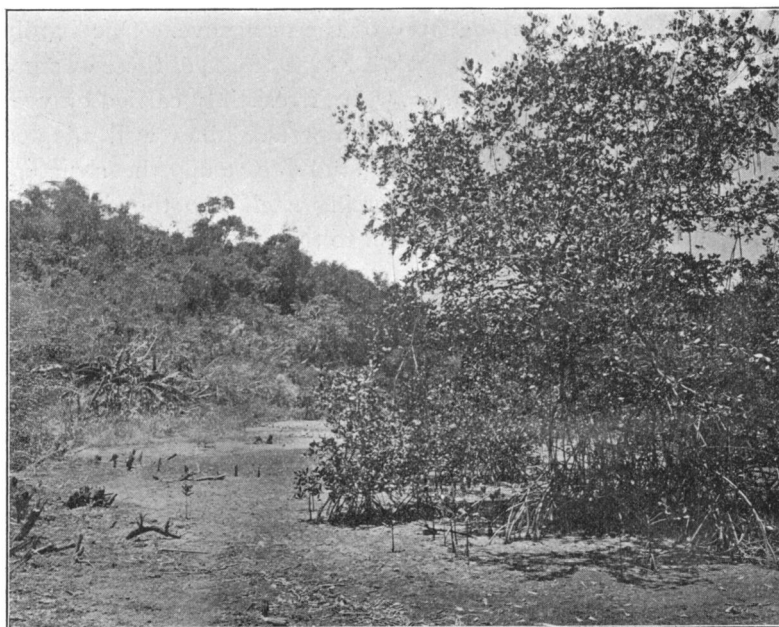


FIG. 4. Rear of a mangrove swamp, showing its recession from the dry land.

this process at last leads to the undoing of the mangrove itself, for, being a lover of the water or of wet places, it finds the new conditions uncongenial and begins to recede, thus vacating the land which it has itself built up, and adding largely, year after year, to the soil available for the purposes of man. In the fourth illustration this stage of the development is depicted. Here may be plainly seen the receding mangrove and the intervening strip of barren land between it and the distant hillside, where the

colony first found a congenial foothold, and from which it has been forced by conditions of its own creating. This barren strip will soon be utilized by man for the growing of crops, and, indeed, the process has already begun, for at the very base of the hill may be seen a small plantation of bananas.

The illustrations accompanying this article were made from photographs taken by the writer on his last journey to Haïti in 1905, and were secured about eighteen miles to the westward of Cap Haïtien.

Here then we have the story of the mangrove. One hardly realizes as he stands looking at the fringe of one of these swamps that a great work is being slowly but irresistibly carried on year after year. Nor does he fully comprehend how well adapted this plant is to its work, until he studies carefully the structure of its fruit, and its method of forcing itself into the domain of the waters, thus transforming them to the uses of mankind. This work is going on in many parts of tropical America through the agency of the plant known to botanists as *Rhizophora Mangle*, a name given to it by Linnaeus in 1753. In other parts of the world are other species of the same genus carrying on the identical work, so perhaps the magnitude of the result may be realized. Not only is the mainland extended by this plant, but islands are formed by it. Some of the floating hypocotyls become stranded on reefs or in other shallow places. At first we have perhaps but a single plant, such an one as is represented to the left of the first illustration. This in time forms its network of roots, catching and retaining detritus, and finally is formed a small island, which continues to grow as long as the mangrove can find congenial surroundings. In the shallow waters surrounding the keys of south Florida many islands have been built up in this way, and these in all stages of development may be seen there now.

There are other land-builders in the tropics, such as the minute coral animals, but perhaps none can excel the mangrove in this work, and certainly in none is the process more apparent.